

REDESCRIPTION OF *MACROSIPHUM IMPATIENTIS* (WILLIAMS),
ANOTHER ROSE APHID FROM EASTERN NORTH AMERICA,
WITH A KEY TO RELATED SPECIES
(HEMIPTERA: APHIDIDAE)

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Abstract.—A poorly known species of aphid, *Macrosiphum impatientis* (Williams) is redescribed. Illustrations are provided, along with a key to North American *Macrosiphum* species with black siphunculi, and notes on biology and distribution. The potential of this species as a pest of roses is discussed.

Key Words: Aphididae, *Macrosiphum*, hosts, roses, *Impatiens*

Macrosiphum Passerini is one of the larger aphid genera, with more than 55 described endemic North American species, excluding species placed in *Sitobion* Mordvilko, which is here considered to be a separate, valid genus, following Eastop and Hille Ris Lambers (1976) and Remaudière and Remaudière (1997). Taxonomy of the group is challenging because many of the species have rarely been collected, and their life cycles and sexual stages are often entirely unknown. One of the most ubiquitous pest aphids in North America is *Macrosiphum euphorbiae* (Thomas), an extremely variable, polyphagous species whose taxonomy and biology are far from completely understood. It is possible that some of the other nominal North American species of *Macrosiphum* are host races of *M. euphorbiae*, or that what is currently regarded as *M. euphorbiae* is actually any number of very similar, more host specific species. Understanding this and the other pest species of the genus requires that they be put in the context of all North American species.

Currently there are no keys for the identification of North American species of *Macrosiphum*. In order to construct comprehensive keys or to complete a meaningful revision of the group much biological information and recently collected material will be required. Therefore, it is prudent for aphidologists to study individual species of the genus when the opportunity presents itself, so that when a revisionary study of the genus is finally attempted, adequate material and information will be available. This paper describes the biology and taxonomy of a particularly enigmatic species, *Macrosiphum impatientis* (Williams), which feeds on *Impatiens* spp. (Balsaminaceae) and *Rosa* spp. (Rosaceae) in eastern North America.

Macrosiphum is a member of the tribe Macrosiphini (Aphididae: Aphidinae). The species are usually large (> 2.0 mm), with antennae longer than the body; legs and siphunculi are also long. Members of *Macrosiphum* can be separated from other genera of Macrosiphini that possess these general features by siphunculi that almost always

have several rows of distinct apical polygonal reticulation and show very little or no swelling medially (Fig. 7), abdominal tergite VIII with 5 or more setae in all adult morphs, tarsal segments I with 3 (very rarely 4) setae in adults and all nymphal instars. Predominant color in life is usually a shade of green, yellow, or pale pinkish to red, sometimes lightly dusted with wax or with mottling of red or pink on the green background color, but some species very pale to white.

MATERIALS AND METHODS

The aphids used in this study were mounted on microscope slides in Canada balsam, and observed under phase contrast microscopy. Terminology follows Miyazaki (1987) except that the base of antennal segment VI is referred to as antennal segment VIa, while the processus terminalis is referred to as antennal segment VIb. Drawings were made by myself using a camera lucida. Abbreviations and terms used are as follows:

- a.s. = antennal segment
- a.s. VIa = basal part of antennal segment VI
- a.s. VIb = apical part of antennal segment VI, often called the processus terminalis
- u.r.s. = ultimate rostral segment
- metatarsal II = second segment of the hind tarsus
- siphunculus = cornicle of earlier authors

Host plant transfers were accomplished by moving winged adult aphids to a potential host plant, then caging them in the field by enclosing a small section of branch in a fine cloth bag, tied securely to prevent predator entry and aphid escape. Transferred aphids were left in the field for about one week before the first check. If live aphids remained in the transfer bags, they were again left for one week. Transfers were considered successful only when transferred aphids produced offspring that survived to adulthood.

Aphids reared in the laboratory were kept on cuttings or whole plants in a vase near a window. Fresh plant material was provided twice each week, or as needed.

Macrosiphum impatientis (Williams)

Siphonophora carnososa var. *impatientis* Williams, 1911: 158.

Siphonophora carnososa var. *impatientis*, incertae sedis, Eastop and Hille Ris Lambers, 1976.

Macrosiphum carnososa subsp. *impatientis*, Smith and Parron, 1978 (placement and identity uncertain).

History

Williams (1911) described this aphid from material collected in Nebraska on *Impatiens pallida* Nutt. He considered it to be a variety of *Siphonophora carnososa* Buckton (= *Microlophium carnosum*), a Palearctic *Urtica*-feeding species. *Macrosiphum impatientis* has not been mentioned again outside of several species lists and host-plant indexes (Wilson and Vickery 1918, Patch 1938, Eastop and Hille Ris Lambers 1976, Smith and Parron 1978). The specimens of *Macrosiphum* from *Impatiens* mentioned by MacGillivray (1968) in her discussion of *Macrosiphum pallidum* (Oestlund), were in fact *M. impatientis*. Correspondence records in the Systematic Entomology Laboratory show that MacGillivray understood the correct placement and identity of *M. impatientis*, but was unable to complete her study of it. MacGillivray designated paralectotypes from the cotypic material in the National Collection of Aphidoidea (located at the Systematic Entomology Laboratory, USDA, Beltsville, Maryland, USA), and these were examined during this study.

Biology

Until now, *M. impatientis* has been collected only from species of *Impatiens*, but studies of *M. impatientis* in Maryland in the summer and fall of 1996 and spring 1997 showed it clearly has a heteroecious life cycle. Several generations of apterous and

alate viviparae were studied in two locations in Beltsville, Maryland, from 24 July through November, 1996. The aphids were found on *Impatiens capensis* Meerb. and generally occurred in small aggregations composed of one or two adults and several nymphs. In October a generation of apterous viviparae, which had been brought into the laboratory, produced first a series of alate viviparae, then males. About the same time, a single alate vivipara was collected in the field on *Rosa multiflora* Thunb., a common exotic shrub. Therefore, alate viviparae were transferred to *R. multiflora* and several other common broadleaf shrubs to test the aphid's host acceptance on potential primary hosts. Alate viviparae were also transferred to *Vaccinium*, *Sambucus*, and *Cornus*, as well as two other unidentified shrubs located near *I. capensis* plants. Only the aphids on *R. multiflora* successfully reproduced, their nymphs developing into oviparous females. Fundatrices of this species were then discovered on many different *R. multiflora* plants during April 1997. Progeny of one of these fundatrices were successfully transferred to *I. capensis* in May 1997. The success of this transfer along with the discovery of many naturally colonizing alate viviparae proved that *M. impatientis* has a heteroecious life cycle between *Rosa* and *Impatiens*. The discovery on *Impatiens* of a small colony composed of oviparae suggested that this species may sometimes overwinter on its secondary host, much as does *M. euphorbiae*.

The historical rarity of this species is evidenced by the paucity of older material in the National Collection of Aphidoidea. Prior to this study, there were several collections made, but these amounted to only a handful of slides. Examination of all available material collected from *Rosa* or *Impatiens* and identified as *Macrosiphum* sp. or *M. euphorbiae* uncovered a few specimens from *Impatiens*, and only one specimen from rose. It appears, however, that the rarity of this species may be changing. It was common and easily found on *I. capen-*

sis during the summer of 1996 in Maryland, and in the spring of 1997 it was common and abundant on *R. multiflora* and *Rosa carolina* L. growing near *I. capensis*. These were the only rose species growing in areas where this aphid was commonly found in 1996 and 1997, the former being a much more common, invasive exotic, and the latter a small, uncommon, native rose. *Rosa multiflora* is becoming more widespread in disturbed and undisturbed habitats. It is likely that *M. impatientis* has become more common in Maryland as *R. multiflora* has invaded *Impatiens* habitat.

Further biological work should be done to determine the pest potential of this aphid on cultivated roses. No transfers of this aphid were made to cultivated roses, but considering that *M. impatientis* can feed on the exotic *R. multiflora*, it is quite likely that it could also feed on other species of exotic cultivated roses.

Distribution

Macrosiphum impatientis is known from Illinois, Maryland, Missouri, Nebraska, Ohio, Pennsylvania, Virginia, and Wisconsin. Given this extensive known distribution, it is likely to live in much of northeastern and midwestern North America.

Description of morphs

Descriptions provided by Williams were extremely brief, and did not mention the vast majority of characters used in modern aphid taxonomy. Descriptions of all adult morphs are provided below to supplement those given by Williams (1911).

Fundatrix (description based on 5 specimens; see Table 1).—Color when alive: dark green, slightly darker than *Rosa* leaf, with black siphunculi. Color when macerated: as in apterous vivipara.

Morphology: body length 3.02–3.32 mm excluding cauda. Antennae about as long as body; a.s. III 0.90–1.02 mm, a.s. IV 0.59–0.71 mm, a.s. V 0.51–0.65 mm, a.s. VIa 0.17–0.19 mm, a.s. VIb 0.78–0.92 mm in length; a.s. III with 8–14 secondary rhinar-

Table 1. Measurements of one side of individual specimens of *Macrosiphum impatientis* fundatrices. All measurements in millimeters, columns of integers represent counts of rhinaria or setae. A ‡ indicates missing data. Label data of specimens studied: 1. MD, Beltsville, ex *R. multiflora*, 16-iv-1997; 2, 3. MD, Beltsville, ex *R. multiflora*, 18-iv-1997; 4. MD, Beltsville, ex *R. multiflora*, 24-iv-1997; 5. MD, Beltsville, ex *R. multiflora*, 25-iv-1997.

Specimen No.	Antennal Segments					2° Rhin. a.s. III	URS	URS setae	Meta-femur	Meta-tibia	Meta-tarsal II	Siph	Cauda		Terg. VIII setae	Body
	III	IV	V	VIa	VIb								Length	Setae		
1	1.02	0.71	0.65	0.19	0.87	14	0.13	7	1.29	2.29	0.14	0.83	0.50	8	6	3.02
2	1.01	0.68	0.64	0.19	0.92	10	0.13	8	1.24	2.32	0.14	0.85	0.55	10	6	3.28
3	0.95	0.65	0.54	0.18	0.82	10	0.14	‡	1.24	2.21	0.14	0.84	0.53	8	6	3.25
4	0.90	0.59	0.51	0.17	0.78	11	0.13	8	1.32	2.34	0.14	0.90	0.52	8	6	3.28
5	0.95	0.61	0.61	0.18	0.80	8	0.13	8	1.22	2.26	0.13	0.85	0.56	10	6	3.32

ia. Ultimate rostral segment 0.13–0.14 mm long, with 7–8 accessory setae. Metafemur 1.22–1.32 mm long. Metatibia 2.21–2.34 mm long. Metatarsal II 0.13–0.14 mm long. Abdominal tergite VIII with 6 setae. Cauda 0.50–0.56 mm long, with 8–10 setae. Otherwise as in apterous vivipara.

Apterous viviparous female (description based on 25 specimens; see Table 2).—Color when alive: shiny green to dark green, usually slightly darker than *I. capensis* leaf, siphunculi strikingly black. Color when macerated: a.s. I sometimes brown medially and laterally; a.s. III usually with region surrounding rhinaria dark brown, and areas basal and apical to rhinaria much paler, with extreme tip dark brown (Fig. 1); a.s. IV usually with extreme base dark brown, and apical ¼ gradually darkening to brown, or entire segment brown; a.s. V–VI uniformly brown. Ultimate rostral segment dusky to brown. Apical ½ of femora darkening to brown. Tibiae usually with base brown, gradually lighter to pale middle, with apex darkening to brown. Tarsi brown. Siphunculi brown to black, often with extreme base paler (Fig. 7). Other parts pale.

Morphology: body length 1.68–3.75 mm excluding cauda. Antennae longer than body; a.s. III 0.78–1.15 mm, a.s. IV 0.62–0.97 mm, a.s. V 0.53–0.80 mm, a.s. VIa 0.15–0.20 mm, a.s. VIb 0.84–1.39 mm in length; a.s. III with 5–18 secondary rhinaria, with imbrications only on basal pale area, remainder of segment smooth; longest setae on a.s. III about equal to basal width of seg-

ment; a.s. I–II smooth, setae about as long as on a.s. III. Head capsule entirely smooth, without ventral protuberance on antennal tubercle; setae about equal to or longer than basal width of a.s. III; at least 1 small spinal tubercle usually present; antennal tubercles very large, far exceeding the negligible median prominence, with 2–4 setae. Rostrum reaching slightly beyond mesocoxae; u.r.s. 0.12–0.14 mm long, with 6–10 accessory setae. Thorax with dorsal setae shorter than basal width of a.s. III; prothorax usually with small marginal tubercles; mesosternal furca stalked. Femora with longest setae longer than basal width of a.s. III, about as long as on antennal tubercles; apical ½ with variable ornamentation composed of raised spinules or imbrications, on pro- and mesofemora absent or very reduced and restricted to anteroventral region, on metafemur much more extensive on anterior surface, sparsely extending into basal ½ of femur; metafemur 0.96–1.56 mm long. Basal ½ of pro- and mesotibiae with longest dorsal setae equal to or slightly longer than longest dorsal setae in apical ½; basal ½ of metatibia with dorsal setae shorter than longest setae on apical ½, the latter setae are unusually long and fine, often appearing bent or twisted (Fig. 6); metatibia 1.84–2.91 mm long. Tarsal segments I with 3 setae, segments II with 2 pairs of dorsal setae (Fig. 4); metatarsal II 0.13–0.16 mm long. Abdominal segments anterior to siphunculi with dorsal setae about ½ basal width of a.s. III; small marginal tubercles sometimes present on these segments; setae

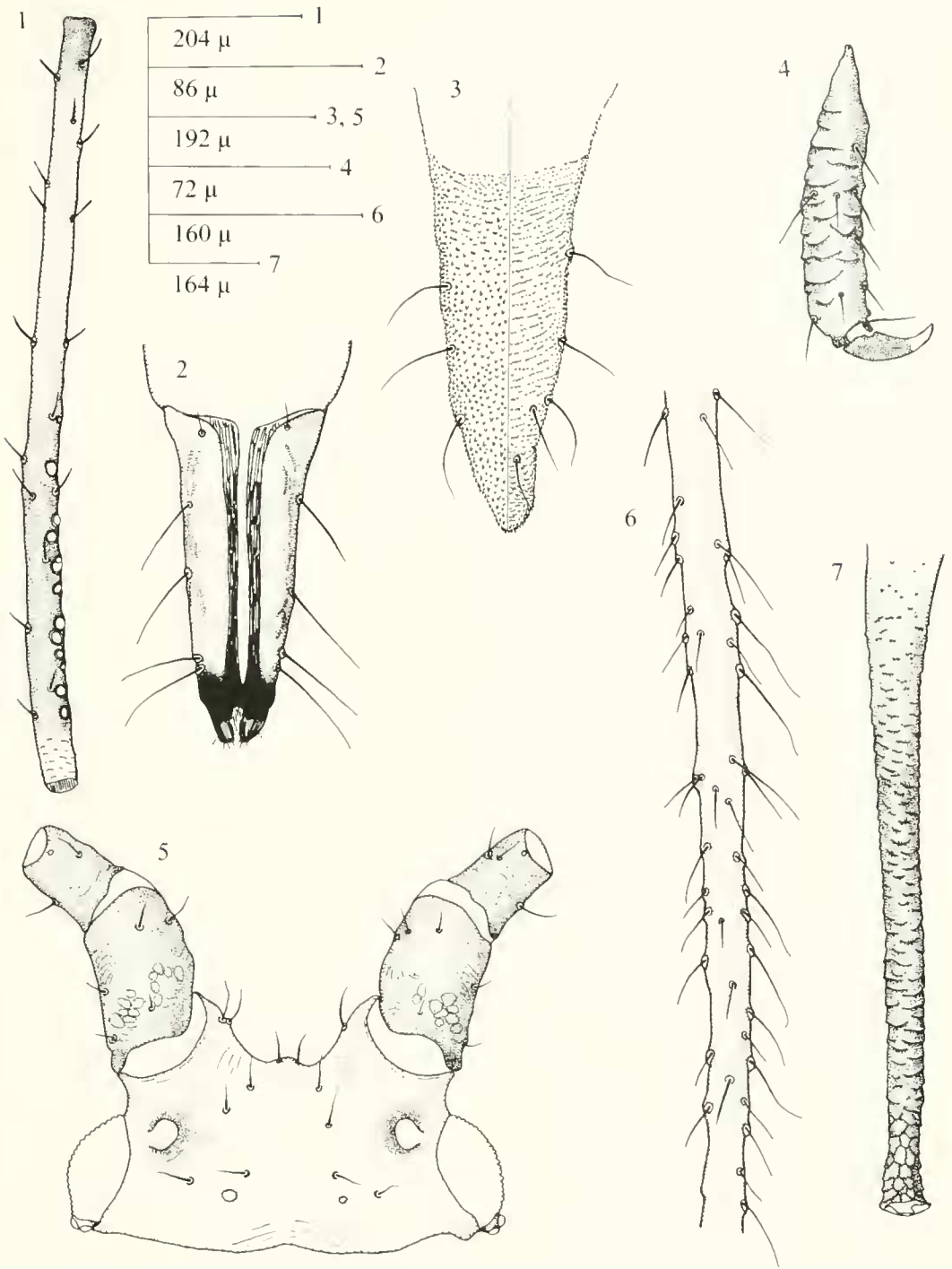
Table 2. Measurements of one side of individual specimens of *Macrosiphum impatientis* apterous viviparae. All measurements in millimeters, columns of integers represent counts of rhinaria or setae. A ‡ indicates missing data. Label data of specimens studied: 1, 2, 3, 13, 14, 15, 16, 17, 18, 19, 20, MD, Beltsville, ex *Impatiens capensis*, x-1996; 4, OH, Wooster, ex *Impatiens aurea*, 19-viii-1920; 5, 6, NH, Durham, ex Spotted touch-me-not, 26-viii-1921; 7, WI, Milwaukee, ex *Impatiens* sp., 19-ix-1933; 8, PA, State College, *Impatiens*, 21-ix-1942; 9, PA, State College, ex *Impatiens*, 24-viii-1946; 10, MD, Beltsville, ex *Impatiens* sp., 5-viii-1996; 11, MD, Greenbelt, ex *I. capensis*, 27-vii-1997; 12, WI, Douglas Co., Waino, ex *I. capensis*, 20-viii-1996; 21, 22, MD, Beltsville, ex *Rosa multiflora*, 22-iv-1997; 23, MD, Beltsville, ex *R. multiflora*, 25-iv-1997; 24, MD, Beltsville, ex *R. multiflora*, 30-iv-1997; 25, MD, Beltsville, ex *I. capensis*, 30-iv-1997.

Specimen No.	Antennal Segments					2 ^d Rhin. a.s. III	URS	URS Setae	Meta-femur	Meta-tibia	Meta-tarsal II	Siph	Cauda		Terg VIII Setae	Body
	III	IV	V	Vfa	Vfb								Length	Setae		
1	1.11	0.87	0.74	0.19	1.37	16	0.13	8	1.44	2.65	0.14	0.88	0.55	8	6	3.02
2	1.09	0.76	0.71	0.19	‡	14	0.14	8	1.39	2.60	0.14	0.85	0.56	8	6	2.94
3	1.15	0.83	0.75	0.19	‡	17	0.14	8	1.45	2.61	0.14	0.87	0.56	8	7	3.28
4	1.03	0.82	0.69	0.18	‡	13	‡	‡	1.40	2.58	0.14	0.82	0.50	‡	‡	2.62
5	0.94	0.69	0.62	0.20	‡	9	0.14	7	1.13	2.06	0.14	0.72	0.42	8	‡	1.98
6	0.87	0.63	0.58	0.15	0.84	6	0.13	‡	1.07	1.91	0.13	0.77	0.39	8	6	2.31
7	1.06	0.97	0.78	‡	‡	11	0.14	10	1.55	2.91	0.16	1.05	0.62	10	6	3.75
8	1.07	0.88	0.67	0.19	1.12	13	0.13	8	1.42	2.56	0.15	0.83	0.51	7	6	2.95
9	1.03	0.79	0.72	0.20	1.22	12	0.13	8	1.44	2.57	0.14	0.91	0.52	9	5	3.14
10	0.78	0.63	0.55	0.15	0.89	9	0.13	8	0.96	1.85	0.13	0.60	0.35	8	‡	1.68
11	0.82	0.62	0.53	0.17	1.08	9	0.13	8	1.00	1.84	0.13	0.62	0.38	10	6	2.31
12	0.96	0.68	0.59	0.17	1.01	5	0.12	8	1.21	2.19	0.13	0.84	0.49	7	7	2.82
13	1.03	0.71	0.67	0.20	1.24	11	0.13	6	1.24	2.38	0.14	0.79	0.49	8	6	2.44
14	1.10	0.87	0.76	0.19	‡	12	0.13	8	1.45	2.65	0.14	0.88	0.57	8	8	3.16
15	1.06	0.78	0.73	0.20	1.26	11	0.13	9	1.39	2.59	0.14	0.85	0.51	8	6	3.14
16	1.12	0.86	0.69	0.16	1.37	13	0.13	8	1.41	2.60	0.13	0.88	0.54	8	7	3.18
17	1.10	0.77	0.76	0.19	1.24	12	0.13	9	1.40	2.61	0.14	0.89	0.50	12	7	2.73
18	1.15	0.85	0.76	0.19	1.37	14	0.13	8	1.45	2.75	0.15	0.92	0.55	10	7	3.03
19	1.15	0.94	0.80	0.20	1.39	18	0.13	9	1.56	2.80	0.14	1.00	0.59	12	7	2.99
20	1.00	0.89	0.69	0.19	1.22	14	0.13	9	1.30	2.48	0.14	0.83	0.51	9	5	3.08
21	0.97	0.76	0.68	0.18	‡	12	0.13	10	1.31	2.37	0.13	0.86	0.50	8	6	3.04
22	0.94	0.73	0.63	0.19	‡	9	0.13	8	1.18	2.25	0.13	0.82	0.50	7	6	2.67
23	0.98	0.70	0.65	0.18	0.98	15	0.13	9	1.25	2.27	0.13	0.87	0.50	10	6	2.84
24	0.94	0.67	0.64	0.18	1.01	14	0.13	8	1.33	2.36	0.14	0.91	0.53	7	6	3.27
25	1.02	0.67	0.62	0.19	0.88	10	0.13	8	1.27	2.39	0.13	0.87	0.59	10	5	3.36

on tergites VI, VII, and VIII progressively longer, those on VIII numbering 5–8, longer than basal width of a.s. III, about as long as setae on antennal tubercles. Siphunculi very gradually tapering from base to apex, 0.60–1.05 mm long, with 4–8 rows of rather large polygonal reticulations; reticulated area not noticeably constricted, with small apical flange; remainder of siphunculi imbricated except extreme base, which is merely spinulose to smooth (Fig. 7). Cauda broad, 0.35–0.62 mm long, with 7–12 setae; ventral surface densely covered with small spinules, many of which are bifurcate (Fig. 3). Ab-

dominal tergite VIII occasionally with 1 or 2 very small spinal tubercles.

Alate viviparous female (description based on 25 specimens; see Table 3).—Color when alive: dark green, with thorax brownish tinged, siphunculi and antennae dark brown to black. Color when macerated: antennae entirely brown to dark brown, except extreme base of a.s. III, which is more or less pale, a.s. III darker than other segments. Head capsule dusky, with dark brown rings around lateral ocelli (Fig. 5). Rostrum with u.r.s. dusky to brown. Apical ½ of femora gradually



Figs. 1-7. *Macrosiphum impatientis*. 1, Antennal segment III of apterous vivipara. 2, Ultimate rostral segment. 3, Cauda of apterous vivipara, left side ventral surface, right side dorsal surface. 4, Second segment of front tarsus. 5, Alate vivipara, dorsum of head and antennal segments I and II. 6, Portion of metatibia of apterous vivipara, showing structure of setae. 7, Siphunculus of apterous vivipara.

Table 3. Measurements of one side of individual specimens of *Macrosiphum impatientis* alate viviparae. All measurements in millimeters, columns of integers represent counts of rhinaria or setae. Label data of specimens studied: 1, 18, 20. MD, Beltsville, ex *Impatiens capensis*, x-1996; 2. Paralectotype, NE, Wabash, ex *Impatiens pallida*, 22-viii-1890; 3, 4, 5, 6. VA, Jackson City, ex *Impatiens fulva*, 17-x-1901; 7, 8, 9. OH, Wooster, ex *Impatiens aurea*, 19-viii-1920; 10. NH, Durham, ex Spotted touch-me-not, 26-viii-1921; 11. WI, Milwaukee, ex *Impatiens* sp., 19-ix-1933; 12. PA, State College, ex *Impatiens*, 21-ix-1942; 13. PA, State College, ex *Impatiens*, 24-viii-1946; 14. VA, Purcellville, ex *Impatiens* sp., 24-vii-1960; 15, 17. MD, Beltsville, ex *Impatiens* sp., 5-viii-1996; 16. MD, Beltsville, ex *Impatiens* sp., 24-vii-1996; 19. MD, Beltsville, ex *Rosa multiflora*, 15-x-1996; 21. MD, Beltsville, *R. multiflora*, 25-iv-1997; 22, 23. MD, Beltsville, ex *I. capensis*, 30-iv-1997; 24. MD, Beltsville, ex *R. multiflora*, 30-iv-1997; 25. MD, Beltsville, *I. capensis*, 7-v-1997.

Specimen No.	Antennal Segments					2 ^o Rhin. a s III	URS	URS Setae	Meta-femur	Meta-tibia	Meta-tarsal II	Siph.	Cauda		Terg. VIII Setae	Body
	III	IV	V	VIa	VIb								Length	Setae		
1	1.03	0.86	0.78	0.19	1.22	35	0.13	9	1.36	2.66	0.15	0.75	0.43	9	6	2.65
2	0.95	0.78	0.66	0.18	1.23	25	0.13	7	1.24	‡	0.13	0.67	0.43	9	6	‡
3	0.92	0.74	0.68	0.17	1.17	30	‡	‡	1.14	2.28	0.13	0.65	0.39	8	‡	2.20
4	0.92	0.74	0.72	0.16	1.22	29	‡	‡	1.24	2.44	0.13	0.75	0.39	8	6	2.90
5	0.91	0.78	0.61	‡	‡	31	0.14	‡	1.21	2.38	0.14	0.69	0.44	7	‡	‡
6	0.83	0.75	0.60	0.16	‡	31	‡	‡	1.20	2.35	0.14	0.71	0.43	8	‡	2.99
7	0.79	0.66	0.65	0.18	1.36	26	‡	‡	1.02	2.06	0.13	0.59	0.32	10	‡	2.01
8	0.95	0.92	0.74	0.20	1.20	31	0.13	10	1.39	2.60	0.15	0.79	0.44	9	‡	2.46
9	0.95	0.83	0.77	0.20	1.25	28	0.13	8	1.28	2.48	0.13	0.73	0.47	9	‡	2.46
10	0.85	0.79	0.70	0.18	1.14	27	‡	‡	1.12	2.21	0.14	0.64	0.41	7	‡	2.61
11	0.91	0.79	0.73	0.19	1.33	30	0.13	8	1.29	2.50	0.15	0.72	0.41	9	8	2.91
12	0.93	0.82	0.69	0.18	1.22	33	0.14	8	1.24	2.36	0.13	0.68	0.38	9	6	2.68
13	0.94	0.92	0.76	0.21	1.27	27	0.13	‡	1.30	2.53	0.13	0.74	0.44	10	5	2.85
14	0.93	0.83	0.76	0.21	‡	30	0.13	‡	1.31	2.46	0.14	0.73	0.44	7	6	2.60
15	0.81	0.71	0.60	0.16	1.20	24	0.13	8	1.00	1.92	0.13	0.55	0.32	9	6	1.94
16	0.72	0.65	0.60	0.17	1.22	28	0.12	‡	1.01	1.90	0.13	0.53	0.27	10	‡	2.22
17	0.79	0.68	0.65	0.14	1.19	20	0.12	8	1.03	2.06	0.13	0.54	0.33	9	6	1.94
18	1.01	0.82	0.74	0.19	‡	34	0.13	‡	1.28	2.57	0.14	0.64	0.40	10	6	2.67
19	1.01	0.83	0.77	0.19	1.34	26	0.13	‡	1.32	2.58	0.14	0.76	0.42	8	6	3.08
20	1.11	0.89	0.80	0.20	1.38	33	0.13	8	1.42	2.70	0.14	0.82	0.46	11	5	3.09
21	0.88	0.70	0.62	0.16	0.92	19	0.13	8	1.12	2.18	0.13	0.61	0.39	10	5	3.09
22	0.92	0.77	0.71	0.17	1.08	29	0.13	‡	1.21	2.34	0.13	0.73	0.43	9	6	2.90
23	0.92	0.74	0.71	0.17	1.03	27	0.12	8	1.19	2.29	0.14	0.74	0.44	10	5	3.07
24	0.93	0.78	0.74	0.17	1.13	29	0.13	8	1.22	2.34	0.14	0.70	0.40	10	7	3.09
25	1.04	0.74	0.74	0.20	1.26	32	0.14	7	1.24	2.50	0.15	0.78	0.44	9	5	3.17

darkening to dark brown or black. Tibiae and tarsi pigmented as in apterous vivipara. Sclerotized thoracic plates dusky. Wing veins dusky, with brown bordering only on base of radial sector. Marginal sclerites on abdominal segments II–V sometimes dusky to light brown. Siphunculi dark brown. Other parts pale.

Morphology: body length 1.94–3.17 mm excluding cauda. Antennal segment III 0.72–1.11 mm, a.s. IV 0.65–0.92 mm, a.s. V 0.60–0.80 mm, a.s. VIa 0.14–0.21 mm, a.s. VIb 0.92–1.38 mm in length; a.s. III with 19–35 secondary rhinaria extending

nearly to apex of segment. Rostrum reaching to rear of mesothorax; u.r.s. 0.12–0.14 mm long, with 7–10 accessory setae. Thoracic sclerotized plates normal. Femoral ornamentation similar to apterous viviparae, except with metafemur ornamentation extending onto posterior surface; metafemur 1.00–1.42 mm long. Metatibia 1.90–2.70 mm long. Metatarsal II 0.13–0.15 mm long. Abdominal tergite VIII with 5–8 setae, which are somewhat longer than the basal width of a.s. III. Siphunculi 0.53–0.82 mm long, otherwise as in apterous viviparae, except often with a few more rows of retic-

Table 4. Measurements of one side of individual specimens of *Macrosiphum impatientis* oviparae. All measurements in millimeters, columns of integers represent counts of rhinaria or setae. A ‡ indicates missing data. Label data of specimens studied: 1, 2, 3, 4, 5, MD, Beltsville, ex *Impatiens capensis*, 29-x-1996; 6, 7, 8, 9, 10, MD, Beltsville, ex *Rosa multiflora*, 14-xi-1996.

Specimen No.	Antennal Segments					2 Rhin a.s. III	URS	URS Setae	Meta-femur	Meta-tibia	Meta-tarsal II	Siph	Cauda		Terg VIII Setae	Body
	III	IV	V	VIa	VIb								Length	Setae		
1	0.75	0.54	0.50	0.16	0.95	5	0.12	9	0.90	1.68	0.13	0.55	0.35	8	6	2.17
2	0.82	0.58	0.58	0.19	1.09	9	0.13	8	1.03	1.84	0.14	0.65	0.38	11	6	2.62
3	0.70	0.47	0.51	0.16	0.95	5	0.12	7	0.87	1.64	0.13	0.56	0.32	7	7	2.08
4	0.75	0.43	0.49	0.17	0.92	4	0.12	8	0.81	1.51	0.12	0.53	0.32	9	‡	2.14
5	0.76	0.49	0.54	0.16	0.93	6	0.13	8	0.91	1.69	0.13	0.60	0.35	9	6	2.22
6	0.66	0.46	0.45	0.15	0.85	6	0.12	8	0.74	1.40	0.11	0.46	0.29	10	6	1.98
7	0.67	0.39	0.48	0.14	0.94	7	0.12	‡	0.76	1.44	0.12	0.46	0.29	9	6	1.86
8	0.70	0.44	0.44	0.13	0.88	6	0.12	8	0.74	1.48	0.12	0.46	0.30	8	6	1.95
9	0.68	0.44	0.46	0.14	0.93	4	0.11	6	0.76	1.39	0.11	0.48	0.28	9	6	1.87
10	0.70	0.44	0.47	0.14	0.83	6	0.12	8	0.78	1.50	0.12	0.50	0.32	11	6	2.10

ulations. Cauda 0.27–0.47 mm long, with 7–11 setae. Otherwise as in apterous viviparae.

Oviparous female (description based on 10 specimens; see Table 4).—Color when alive: bright reddish orange, with a faint greenish spinal stripe, siphunculi and metatibiae strikingly black. Antennal segments III–VI entirely brown except extreme base of a.s. III, area of rhinaria and joints between segments III and IV and IV and V darker brown; a.s. I dusky, darker medially. Metatibia entirely dark brown. Otherwise pale.

Morphology: body length 1.86–2.62 mm excluding cauda. Antennal segment III 0.66–0.82 mm, a.s. IV 0.39–0.58 mm, a.s. V 0.44–0.58 mm, a.s. VIa 0.13–0.19 mm, a.s. VIb 0.83–1.09 mm in length; a.s. III with 4–9 secondary rhinaria. Head capsule usually without spinal tubercles. Ultimate rostral segment 0.11–0.13 mm long, with 6–9 accessory setae. Metafemur 0.74–1.03 mm long. Metatibia 1.39–1.84 mm long, with numerous scent plaques (=pseudosensoria) covering most of its length; area covered by scent plaques slightly swollen. Metatarsal II 0.11–0.14 mm long. Abdominal tergite VIII with 6–7 setae. Siphunculi almost entirely cylindrical, tapering only at extreme base, 0.46–0.65 mm long, with 2–5 rows polygonal reticulations. Cauda

0.28–0.38 mm long, with 7–11 setae. Otherwise as in apterous vivipara.

Alate male (description based on 10 specimens; see Table 5).—Color when alive: reddish with many brown cuticular markings, black siphunculi and antennae. Color when macerated: antennae entirely brown, with a.s. II and III darker than other segments. Head capsule brown, with areas surrounding all 3 ocelli darker brown. Rostral segment III and u.r.s. brown. Prothorax brown, mesothoracic plates dark brown. Apical ½ of femora darkening to very dark brown. Tibiae entirely brown, but with middle part lighter brown than base and apex. Tarsi brown. Wing veins as in alate vivipara. Abdomen with these parts dusky to light brown: marginal sclerites on segments I–VII, ante- and postsiphuncular sclerites, 5 pairs of pleural intersegmental muscle attachment plates, and irregular spinal blotches or spots on tergites II–V and sometimes VII. Siphunculi dark brown. Claspers variably dusky to light brown. Other parts pale.

Morphology: body length 2.23–2.76 mm excluding cauda. Antennal segment III 0.89–1.05 mm, a.s. IV 0.78–0.89 mm, a.s. V 0.65–0.80 mm, a.s. VIa 0.16–0.21 mm, a.s. VIb 1.26–1.50 mm in length; longest setae on a.s. III slightly shorter than basal width of the segment. Secondary rhinaria on antennal segments: III, 63–77; IV, 0–2;

Table 5. Measurements of one side of individual specimens of *Macrosiphum impatientis* alate males. A ‡ indicates missing data. All measurements in millimeters, columns of integers represent counts of rhinaria or setae. Label data of specimens studied: 1, 2, 3. VA, Jackson City, ex *Impatiens fulva*, 17-x-1901; 4, 5, 6, 7, 8, 9, 10. MD, Beltsville, ex *I. capensis*, x-1996.

Specimen No.	Antennal Segments					2 ^o Rhm.			URS	URS Setae	Meta-femur	Meta-tibia
	III	IV	V	VIa	VIb	III	IV	V				
1	0.89	0.79	0.65	0.16	1.34	64	0	12	‡	‡	1.09	2.14
2	0.94	0.80	0.71	0.16	1.26	68	2	13	‡	‡	1.14	2.22
3	0.94	0.84	0.70	0.16	1.36	67	0	18	‡	‡	1.14	2.25
4	1.00	0.86	0.77	0.19	1.47	77	0	17	0.13	8	1.25	2.33
5	1.05	0.88	0.72	0.18	1.39	70	0	21	0.13	8	1.28	2.34
6	0.99	0.87	0.75	0.19	1.50	77	0	18	0.13	‡	1.26	2.36
7	0.99	0.86	0.80	0.19	1.42	64	0	17	0.14	8	1.27	2.31
8	0.96	0.78	0.73	0.18	1.48	75	0	18	0.13	8	1.16	2.24
9	1.00	0.82	0.74	0.21	1.31	63	0	19	0.13	9	1.28	2.38
10	1.00	0.89	0.76	0.19	1.42	69	0	14	0.13	6	1.20	2.30

V, 12–21. Head capsule often with 1 or 2 small spinal tubercles. Rostrum reaching to rear of mesothorax; u.r.s. 0.13–0.14 mm long, with 6–9 accessory setae. Metafemur 1.09–1.28 mm long. Metatibia 2.14–2.38 mm long. Metatarsal II 0.13–0.15 mm long. Abdominal segments anterior to siphunculi with dorsal setae about as long as longest setae on a.s. III; tergite VIII with 5–9 setae. Siphunculi 0.59–0.72 mm long. Cauda broad at base, strongly tapering apically, 0.22–0.31 mm long, with 7–13 setae. Claspers and aedeagus normal. Otherwise as in apterous vivipara.

KEY TO NORTH AMERICAN *MACROSIPHUM*
WHOSE APTEROUS VIVIPARAE HAVE BLACK
SIPHUNCULI AND PALE, MEMBRANOUS
ABDOMINAL TERGA

Construction of an effective key to the species of *Macrosiphum* is made difficult by our poor knowledge of the biology, distributions, and ranges of variation of most of the species in the genus. This key treats only a few of the many *Macrosiphum* known in North America, and is based only on slide-mounted material in the National Collection of Aphidoidea. Future collecting and biological work may show that there are other species that belong in this key, or that characters used in the key are not valid when the full ranges of variation for these

species are examined. All *Macrosiphum* species known to feed on roses in North America are included in this key except *M. euphorbiae*, the most common pest species in the genus. It can be separated from all species in this key by its siphunculi, which are pale or have the apical ¼ or less pigmented. Despite previous placement in *Sitobion*, the species *Macrosiphum salviae* Bartholomew is here considered to belong to *Macrosiphum*, following the suggestion in Jensen (1997). Characters refer to alate and apterous viviparous females, except when one or the other is specified.

1. Apterous viviparae with dark brown to black postsiphuncular sclerites; alate viviparae with dark brown ante- and postsiphuncular sclerites 2
- Apterous viviparae with pale postsiphuncular sclerites; alate viviparae without ante- or postsiphuncular sclerites, or with one sclerite but not the other 3
- 2 (1). Cauda pale; apterous viviparae with rhinaria limited to basal ½ of a.s. III; a.s. III smooth in middle; widely distributed, on Rosaceae, Dipsacaceae, Valerianaceae and sometimes other plants
 *Macrosiphum rosae* (L.)
- Cauda brown to black; apterous viviparae with rhinaria covering nearly the full length of a.s. III; a.s. III imbricated throughout; known from New York, on *Smilacina racemosa* (Liliaceae)
 . . . *Macrosiphum pechumani* MacGillivray

bases of tibiae medium brown, not dramatically darker than bases of femora; apterous viviparae with a.s. III more or less uniformly brown; alate viviparae with tibiae dark throughout; on various Lamiaceae in subtropical North America and in Central and South America
 *Macrosiphum salviae* Bartholomew

7 (6). Siphunculi entirely black; a.s. III of apterous viviparae with fewer than 8 rhinaria; hind tibia with normal setae; alate viviparae with fewer than 20 rhinaria on a.s. III, on lilies (Liliaceae), including cultivated varieties, in eastern North America
 *Macrosiphum lilii* (Monell)

Siphunculi with very narrow pale area at extreme base (Fig. 7); apterous viviparae almost always with more than 8 rhinaria on a.s. III; hind tibiae with some dorsal setae in apical 1/2 unusually long and fine, often appearing bent or twisted; alate viviparae with more than 20 rhinaria on a.s. III; on *Impatiens* (Balsaminaceae) and *Rosa* (Rosaceae) in eastern North America
 *Macrosiphum impatientis* (Williams)

8 (5). Forewing of alate viviparae with anal and cubital veins thick, bordered in brown; cauda usually with 3 pairs of setae; a.s. III imbricated throughout 9

Forewing of alate viviparae with anal and cubital veins thinner, pale, not bordered with brown; cauda usually with 4-5 pairs of setae; a.s. III usually smooth in middle 10

9 (8). Alate viviparae with 10 or more rhinaria scattered over about basal 3/4 of a.s. III; on *Rumex*, other Polygonaceae, and sometimes Convolvulaceae, widely distributed in eastern North America
 *Macrosiphum venae fuscae* Davis

Alate viviparae usually with fewer than 10 rhinaria restricted to basal 1/2 of a.s. III; on wild and cultivated geraniums (Geraniaceae), apparently widely distributed east of the Rocky Mountains, but also recorded from California
 *Macrosiphum geranii* (Oestlund)

10 (8). Tergites VII and VIII with spinal tubercles; apterous viviparae with tibiae usually entirely dark brown to black; a.s. III of apterous viviparae usually with fewer than 10 rhinaria (MacGillivray 1968); hind tibia with dorsal setae normal (Fig. 8); on Rosaceae, usually *Rosa* and per-

haps sometimes on other plants, in eastern North America
 *Macrosiphum pallidum* (Oestlund)

Tergites VII and VIII without spinal tubercles, or if present on VIII, small; apterous viviparae with tibiae usually pale in middle; a.s. III of apterous viviparae usually with more than 10 rhinaria; hind tibia with some dorsal setae in apical 1/2 unusually long and fine, often appearing bent or twisted (Fig. 6); on *Impatiens* (Balsaminaceae) and *Rosa* (Rosaceae) in eastern North America
 *Macrosiphum impatientis* (Williams)

ACKNOWLEDGMENTS

Many thanks go to C.K. Chan, Susan Halbert, Alma Solis, David Voegtlin, and one anonymous reviewer for helpful suggestions on the manuscript. Thanks also to Susan Halbert, Florida State Collection of Arthropods, for a loan of specimens.

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